BUILDING ENERGY SIMULATION

Volume 19 ¨ No 2 ¨ Summer 1998

For Users of DOE-2, SPARK, BLAST and their Derivatives

User News

What's New?

¨ **GenOpt** ... Be the first on your block to *alpha-test* this new generic optimization program. Details are on p. 12.

¨ **New hourly weather for bin energy analysis** ... Read about the Gas Research Institute's new "BinMaker" software under Weather Resources, p. 24.

¨ **"Compare-IT"** ... From RLW Analytics of Sonoma, CA. Their new software helps you run "what if" scenarios with DOE-2. Turn to p. 18.

¨ **The Answer Man** ... tackles questions on TMY to TMY2 converters and atmospheric turbidity values. See p. 23.

¨ **The Dreaded "Y2K" Problem** ... Don't fret! The "Year 2000" problem has been fixed in both DOE-2.2 and DOE-2.1E (see bug fixes on p. 5).

¨ **Consultant Hank Jackson** ... of Weaverville, NC has a new phone number: (828) 658-0474

¨ **New Consultants** ... Welcome to four new DOE-2 consultants; see p. 11

¨ **Bruce Birdsall / DOE-2 Help Desk** ... Please make a note of Bruce's new phone number: (925) 671-6942

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What's Inside?

The User News is published by the Simulation Research Group at Lawrence Berkeley National Laboratory with cooperation from the BLAST Support Office at the University of Illinois. Direct comments or submissions to Kathy Ellington, MS: 90-3147, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, or email kathy@srge.lbl.gov or fax us at (510) 486- 4089. Direct BLAST-related inquiries to the BLAST Support Office, phone (217) 333-3977 or email support@blast.bso.uiuc.ed. ☺☺☺ ☺☺ 7/98 2000

DOE-2.2

A New Generation in DOE-2 Building Energy Analysis

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Introduction

DOE-2.2, the much awaited and newest generation of the DOE-2 building energy analysis program, is ready for public release. DOE-2.2 adds significant new modeling capabilities to DOE-2.1E and facilitates the use of interactive products.

Collaborators

The DOE-2.2 project is a collaboration between Lawrence Berkeley National Laboratory (LBNL), funded by the U.S. Department of Energy (DOE), and James J. Hirsch and Associates (JJH), with funding from the Electric Power Research Institute (EPRI) as well as other gas and electric utility industry organizations.

Product Development

DOE-2.2 development started in 1992. The project's initial concept was to update and enhance DOE-2 to allow direct and close integration with graphical user interfaces, such as PowerDOE. The objective was to make DOE-2 easier to learn and less expensive to use, thus extending DOE-2's detailed modeling capabilities to building designers rather than only to energy analyst specialists. As the project proceeded, the benefit and need for significant enhancements to the DOE-2 simulation engine became evident; this has produced a new "standard" version of DOE-2, i.e., DOE-2.2. DOE-2.2 is open (source and executable licensing through vendors), inexpensive (a few hundred dollars for a single-user license), well documented and supported.

This article provides an overview of the DOE-2.2 simulation enhancements. Additional features under development for future releases are briefly described. Minimum machine configuration requirements and how to obtain the applications are also described.

DOE-2.2 Enhancements

Space constraints permit only a brief description of the most important DOE-2.2 enhancements over DOE-2.1E.

- ***Circulation Loops***
  DOE-2.2 now uses an integrated air-side/water-side HVAC simulator (i.e., the DOE-2.1E SYSTEM and PLANT programs were replaced with a combined HVAC simulation program). One benefit from this change is improved connectivity between the loads incurred by the secondary HVAC systems (air handler coils, reheat coils, etc.) and the primary HVAC equipment (boilers, chillers, etc.). Primary equipment, terminal units and coils are now attached to specific circulation loops. Currently, three levels of circulation loops are provided: "dedicated" equipment loops (serving specific pieces of primary equipment), "primary" loops and "secondary"

loops. Each level of loop may have associated constant-volume or variable-volume pumps. Different coils in the same zone or system (e.g., preheat coils, reheat coils and baseboards) can be served by different loops.

- ***Central Plant Equipment***
  Each chiller, boiler, pump, etc., is now modeled separately. Thus each piece of equipment can now have unique size and performance characteristics. New equipment selections are: ground loop heat exchangers (GLHX) for use with water source heat pumps, heat rejection equipment including enhanced cooling tower and fluid cooler models with heat exchangers, improved control modeling including hot and chilled water temperature reset, expanded equipment assignment to meet loop loads and many "load management" modes for control of overall plant operation.

- ***Air Handling Equipment***
  A Dual Fan option has been added to the Dual Duct, Multi-Zone, and Packaged Multi-Zone simulation. The location of the return fan can be specified in either the return or relief air stream. Exhaust fans can be scheduled separately from the supply/return fans. All coils can be independently assigned to fluid loops.

- ***Metering***
  Three levels of electric and fuel meters can be defined (site, building, and sub-building) with up to 100 total meters allowed in an arbitrary tree structure. Any energy-consuming equipment can be individually assigned to a meter. All meters have separate and combined summary and hourly report capabilities. All meters include a transformer model that allows the accounting of stand-by losses and performance as a function of load. Also, 15-, 30-, and 60-minute demand intervals (either fixed or floating windows) are supported for the most important HVAC electric equipment; these demand intervals are also accounted for in the utility rate calculation.

- ***Scheduling and Design Days***
  Design Days can be specified in a more common format using familiar values from ASHRAE (and other) sources. Schedules have been improved to allow separate specification of profiles for Design Days vs. normal simulation run periods. Schedules now include many new types with support for metric specifications. Reset schedule now include day/night alternate values.

- ***Expressions***
  Expressions are general multi-line equation-like entries used to calculate input values. Expressions can be simple or complex, arithmetic or logical, and can reference one or more other building parameters. Expressions differ from input macros (still supported) in that they operate on actual keyword values rather than simply manipulate text. Using expressions, overall building dimensions or zoning can be easily changed; for example, you would use expressions to modify the floor footprint and zone depth.

- ***Polygons***
  Exterior, interior and underground walls, roofs and floors can now be described as arbitrary polygons (up to 30 sides). Polygons can also be used for floor and space footprints to greatly decrease the time required for inputting architectural building features.

- ***Windows***
  Windows can now be “built up” in a layer-by-layer manner, combining multiple glass layers, gaps and/or blinds.

- ***Lighting systems***
  Lighting systems can now be described on a luminaire-by-luminaire basis or you can describe a target illuminance and DOE-2.2 will calculate the required number of luminaires.

- ***Multiple Lighting and Equipment Profiles***
  Previously, only one lighting and one equipment profile could be input per space (e.g., one density with one associated schedule). DOE-2.2 permits up to five lighting and five equipment profiles per space.

- ***Libraries***
  DOE-2.2 now uses a more general library feature that permits you to store and retrieve a much broader variety of building components, including windows, blinds, walls, luminaires, lamps, spaces, schedules, air handlers and central plant equipment. The standard library includes extensive schedules for common building types, space and equipment usage and extensive primary/secondary equipment performance curves (with user override capabilities).

- ***Documentation***
  DOE-2.2 has three manuals. The *DOE-2.2 Basics Manual* (an extension of the *DOE-2.1E Basics Manual*) is an introduction to DOE-2 for new users. The old *DOE-2.1A Reference Manual*, *DOE-2.1E Supplement* and *DOE-2.1E BDL Summary* have been combined (at last) into the *DOE-2.2 Command/Keyword Dictionary* which defines all of the commands and keywords in the DOE-2.2 input language. *The DOE-2.2 Topics Manual* goes into modeling details on "topics" like daylighting or circulation loops.

Machine Requirements

DOE-2.2 versions will be available for DOS, Microsoft Windows (exe and DLL format), Unix, VAX, and other common operating systems; hardware requirements vary, but generally 32 Mb of RAM and 200 Mb of hard disk space is required.

Future Development of DOE-2.2

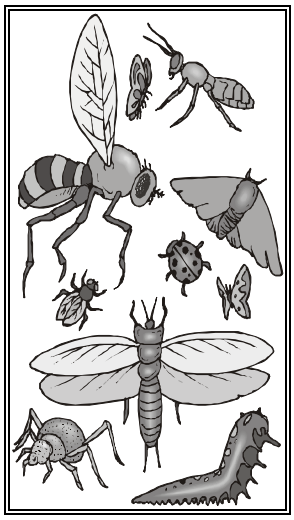
Subsequent releases of DOE-2.2 are planned that will incorporate additional features. Planned program additions include:

- A module for modeling commercial facilities (supermarkets, food service) and industrial facilities (warehouses, food processing) with complex refrigeration systems including refrigerant piping networks, compressor racks and chillers with alternative refrigerants, controls, air-units, display cases, condensers, and heat reclaim for HVAC and DHW.
- Simulation of kitchen equipment for food service installations.
- A module for showing compliance with building energy standards (e.g., ASHRAE 90.1 and California Title 24).

Availability

DOE-2.2 is expected to be available from LBNL and JJH (and JJH resellers) for commercial distribution in July or August of 1998. Contact either

Kathy Ellington at LBNL	kathy@srge.lbl.gov
or	
Jeff Hirsch at JJH	Jeff.Hirsch@DOE2.com.



DOE-2.1E Bug Fixes 92 through 95

Following are bug fixes 92 through 95. Shown at the left is the version number of DOE-2.1E, which is incremented for each new set of fixes. This is followed on the same line by the subprograms to the which the fixes were made (bdl = Building Description Language Processor, lds = LOADS program, sys = SYSTEMS program, etc.). Then comes a short description of the set of fixes corresponding to that version number. The author's initials and date of each fix are also shown. Note that a particular version will include all fixes made up to and including that version number. So Version 005, for example, includes the fixes listed under "-005" as well as those listed under "-003" and "-004". You can easily determine what version number of DOE-2.1E you are currently using by checking any of the DOE-2 output reports, where version *NNN* is indicated as "DOE-2.1E-*NNN*".

These bug fixes are also available via FTP from the Simulation Research Group at LBNL. Turn to p. 22 of this newsletter for instructions.

-092 : wth

Fixed some bugs discovered with the PowerStation compiler. None of these should affect any normal user. [WFB 7-25-97]

-093 : bdl dedt lds

(1) Fix a bug in the calculation of reflected irradiance in sunspaces when one or more sunspace exterior windows is from WINDOW-4 library. In this case, the reflectance of the window for diffuse radiation in the sunspace was 100% (rather than 10-15%). This led to an overestimate of reflected diffuse radiation absorbed by the opaque part of sunspace interior walls or transmitted/absorbed by sunspace interior windows. Important only when exterior window > about 30% of sunspace inside area.

Workaround: use GLASS-TYPE-CODE ≤ 11 in sunspace exterior windows. This is not a problem for sunspace interior windows, for which GLASS-TYPE-CODE ≤ 11 or WINDOW-4 library can be used.

(2) Improve calculation of diffuse radiation from exterior windows that is incident on sunspace interior walls after multiple reflections from sunspace interior surfaces [FCW 4-22-98]

-094 : sys

In some unusual cases, the "HOURS UNDER HEATED" and "HOURS UNDER COOLED" columns in SS-F and the "PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE" value in BEPS are incorrect. In particular this occurs when a zone has no control capability; i.e., ERMAX=ERMIN. If this is done deliberately (such as a slave zone with no baseboard or zone coil in PSZ) by the user then all is well. But if the user has mistakenly input a defective system with no control capability, the lack of warning by the program needs to be fixed. This mod will insure that SS-F and BEPS indicate under-heating or -cooling when the input indicates that zone control was intended. The criteria for under-heating or -cooling are slightly changed. Before, it was cooling (or heating) setpoint plus (or minus) the throttling range . Now it is cooling (or heating) setpoint plus (or minus) half the throttling range plus (or minus) 1F. The numbers in SS-F and the percent in BEPS may change slightly. [WFB 5-15-98]

-095 : bdl sim

RUN-PERIODS are limited to years less than 2000. This mod fixes the problem. [WFB 6-11-98]

Release of the PowerDOE Program

J. J. HIRSCH, M. S. ADDISON, S. A. CRISWELL, S. D. GATES
JAMES J. HIRSCH & ASSOCIATES, CAMARILLO, CA USA

Introduction

PowerDOE®, a Windows-based graphical application that incorporates DOE-2.2, will soon be available for commercial distribution. It offers the first interactive and graphical environment for DOE-2.2 that is both user-friendly and comprehensive. Support for the development of the PowerDOE user interface was provided by the Electric Power Research Institute, Southern California Edison, Pacific Gas and Electric, Southern Company, and Bonneville Power Administration.

User Interface

PowerDOE's user interface provides visual feedback that greatly reduces the time required to prepare an accurate building description. The Building View screen (Fig. 1) displays a 3-D view of all building and external shading surfaces; this allows you to quickly catch gross building and external shading geometry errors. You may shift the position of the viewer and suppress the display of any selected surface. From the 3-D view, you may also click on the building element to edit it.

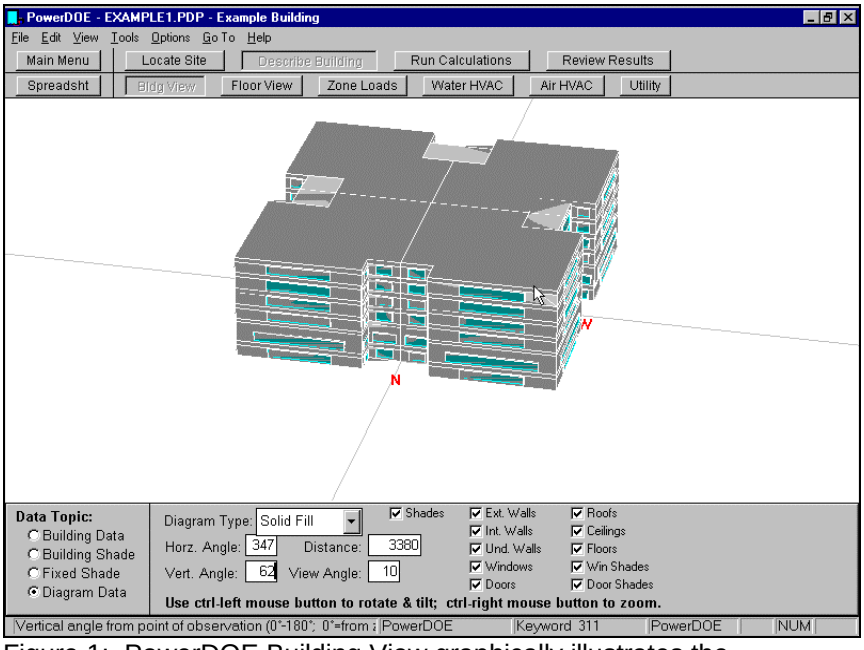


Figure 1: PowerDOE Building View graphically illustrates the building envelope.

The program is organized into four main modules: LOCATE SITE (e.g., select weather data), DESCRIBE BUILDING (architectural and HVAC input screens), RUN CALCULATIONS (specify simulation periods and hourly reporting) and REVIEW RESULTS (graphical summary of simulation results).

Locate Site

PowerDOE comes with an extensive library of average year weather data from over 650 standard weather files for North America, e.g., TMY, TMY2, WYEC, WYEC2, CTZ, TRY, etc. (Fig. 2). Other site-related data may be speci-fied, including design day data.

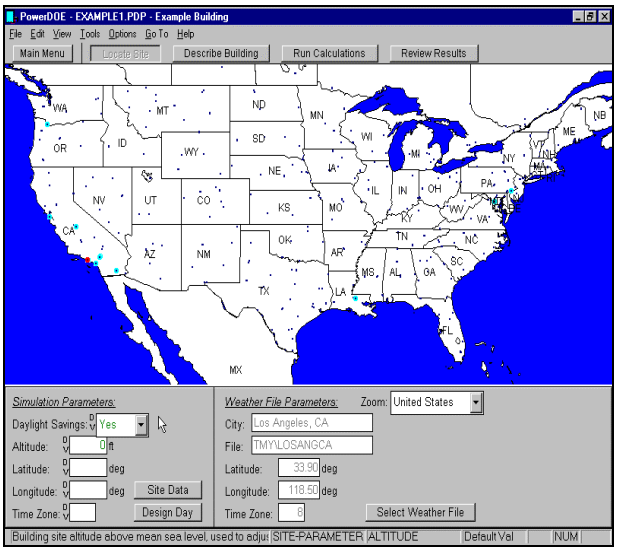


Figure 2: PowerDOE Locate Site screen. Dots mark available weather data.

Describe Building

PowerDOE organizes architectural and HVAC building components in a hierarchy intuitive to both designers and analysts. Building areas are grouped into floor plans (Figs. 3 and 3A) and HVAC equipment is grouped by air and water flow paths that supply building HVAC requirements (Figs. 4 and 5). Using the new expressions capability of DOE-2.2, building models can be created that are more flexible than ever. For example, using expressions to describe the layout of the example floor plan (Fig. 3), the floor footprint and zone depth are modified into the floor plan (Fig. 3A) by changing only four user-defined input parameters (overall building length, façade "notch" width and depth, and perimeter zone depth).

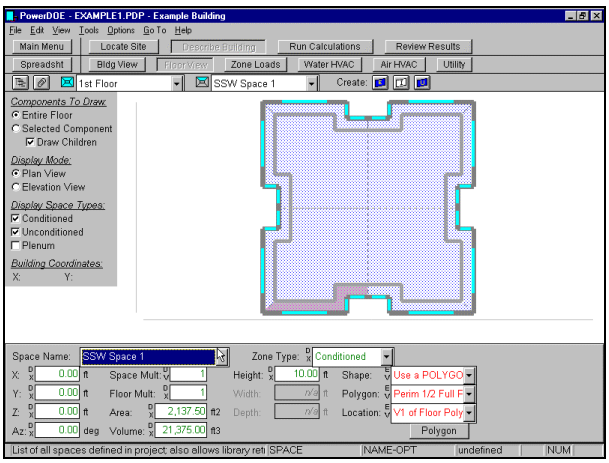


Figure 3: PowerDOE Floor View screen with space data displayed at bottom of screen.

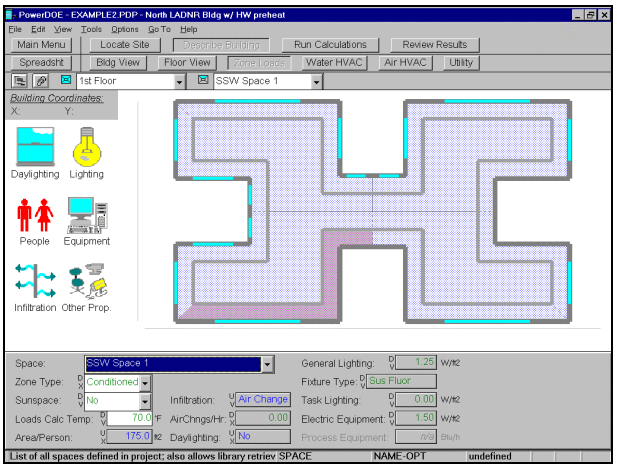


Figure 3A: PowerDOE Zone Loads screen with floor plan modified using expressions (compare Fig. 3).

Air-side and water-side screens (Figs. 4 and 5) help you readily identify the equipment installed on each air-side and water-side circuit. For example, on the air-side equipment screen shown in Figure 6, installed system options are illustrated by colored icons. Uninstalled system options are shown as dotted gray outlines. You double-click on these uninstalled pieces of equipment to install them. On the chilled water loop screen shown in Figure 5, installed suppliers (chillers) are shown on the top leg of the loop. Demanders (chilled water coils) are shown on the bottom leg of the loop.

Most of PowerDOE's input screens are organized to illustrate the selected building component while simultaneously displaying only the most important data pertaining to it. For example, in Figure 6, the lower portion of the screen is used to display the most important data describing the system. More detailed inputs and component descriptions are accessible if desired (Fig. 7) either by clicking on the "More" button in the lower right hand corner of the screen or by double-clicking on any icon for a selected system option (e.g., double-clicking on the DX cooling coil). Similarly, by double-clicking on primary equipment icons in Figure 5, more detailed information is presented for the selected piece of primary equipment (Fig. 8).

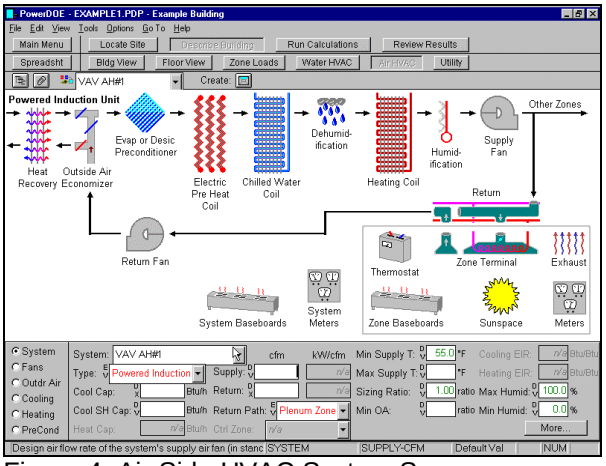


Figure 4: Air-Side HVAC System Screen

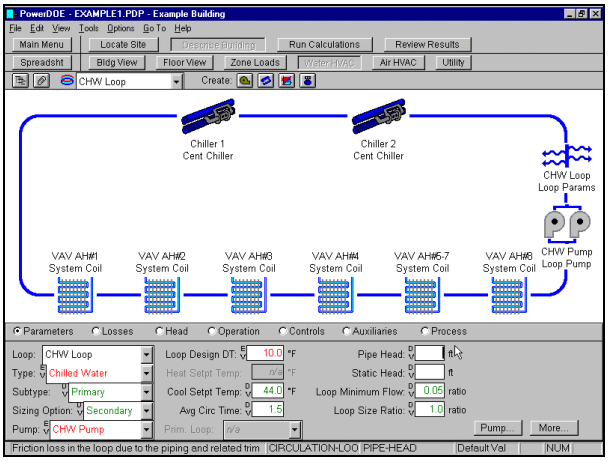


Figure 5: Water-Side HVAC Equipment Screen

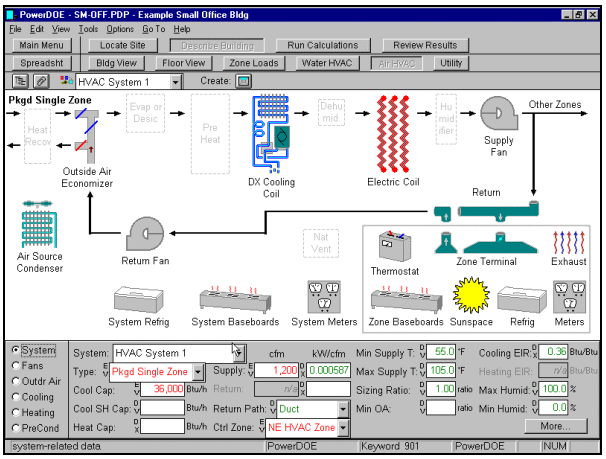


Figure 6: Air-Side System Screen with uninstalled system options as gray dotted outline

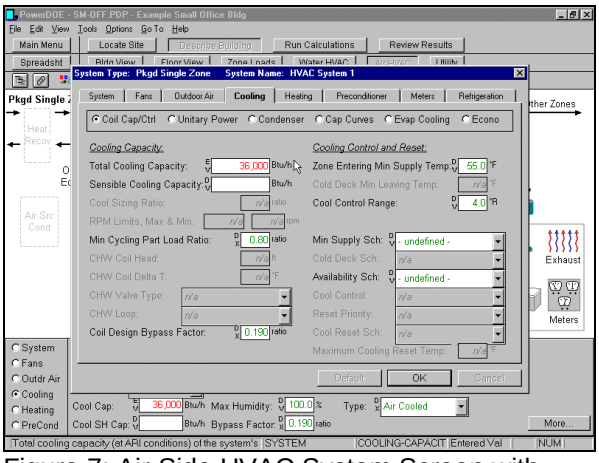


Figure 7: Air-Side HVAC System Screen with detailed system data dialog displayed.

On all PowerDOE screens, only those controls (i.e., input fields) that are applicable to the current building description or selected component are active. Inactive controls are grayed back and marked "*n/a*" (Fig. 7).

"Zoning" a selected building floor into separate spaces can be done graphically (Fig. 9) by simply pointing and clicking to outline the desired zone boundaries. This method of defining spaces uses polygons to define the space shape, which later greatly speeds the placement of the walls, ceilings and floors that surround spaces.

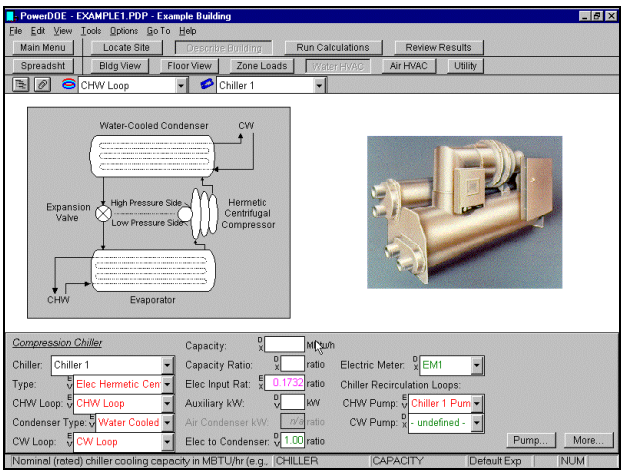


Figure 8: PowerDOE primary equipment screen.

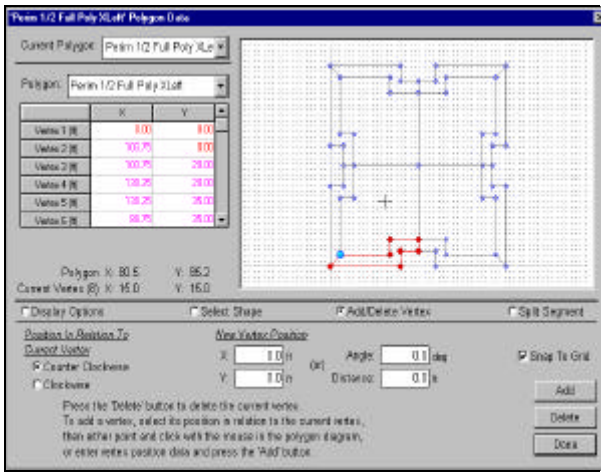


Figure 9: PowerDOE polygon dialog shows the outline of spaces on a selected floor.

Pop-up “tabbed dialog boxes” (Figs. 7 and 11),allow you to quickly review all relevant inputs pertaining to a selected building component. Alternatively, PowerDOE also provides a global summary worksheet in a spreadsheet-like format containing data for all building elements (Fig. 10). This spreadsheet display mode is especially useful for reviewing a specific input (e.g., window glass type) across all components to which it applies (i.e., across all windows in the building). The building data spreadsheet lets you efficiently review or directly edit any building data from this central “database.”

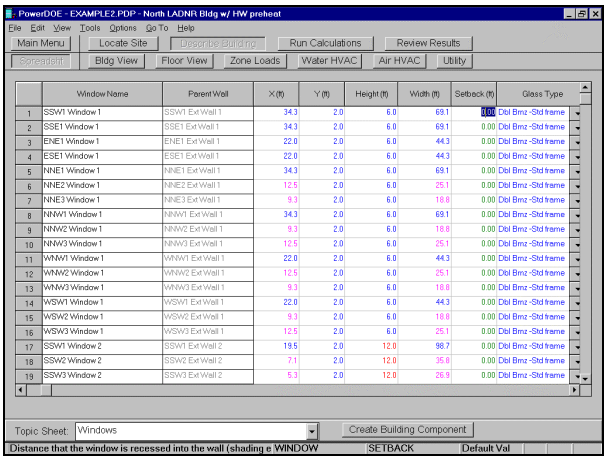


Figure 10: PowerDOE spreadsheet building database.

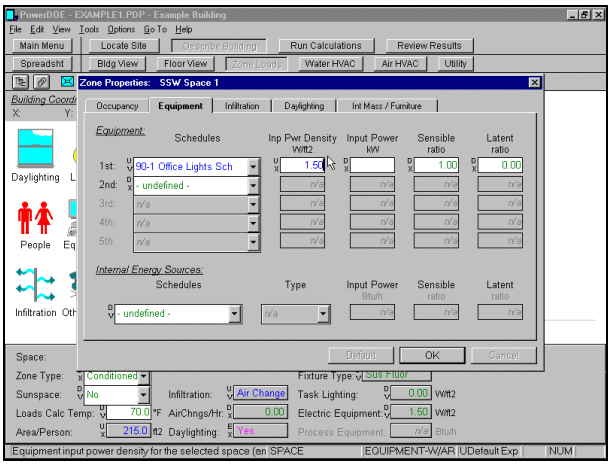


Figure 11: PowerDOE Zone Loads screen with detailed space load dialog displayed.

Space internal loads (people, lighting, daylighting, equipment and infiltration) are input using the Zone Loads screen (Figure 11, shown above with the zone loads detailed data tabbed dialog displayed). Schedules may be reviewed or edited from anywhere in the interface with a right mouse click. Schedules allow all building and HVAC schedule profiles to be entered either graphically, numerically, or with expressions (Fig. 12). To easily compare various schedules, PowerDOE can multiple weekly schedules side-by-side, as shown in Figure 13.

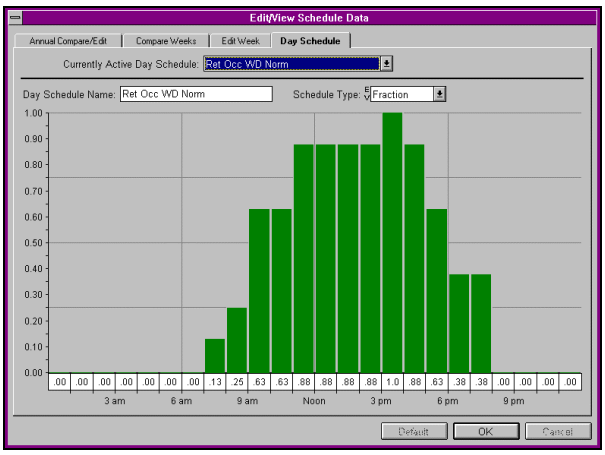


Figure 12: Day Schedule Screen

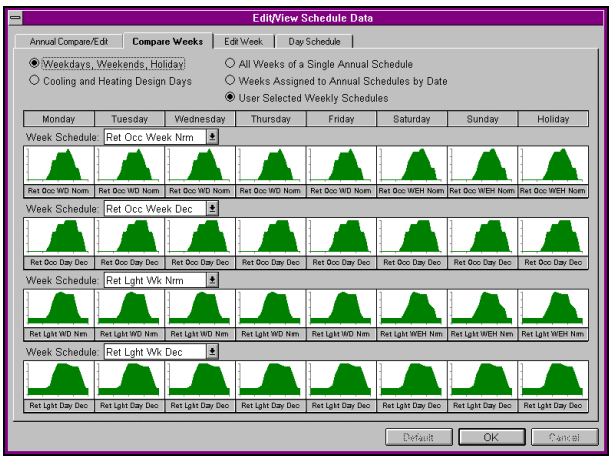


Figure 13: Compare Weekly Schedule Screen

Review Results

Results are reviewed in a separate application called DOE-2REV that lets you prepare and display customized reports (Fig 14). When running PowerDOE, DOE-2REV is seamlessly integrated with full navigation functionality between the two applications as if they were one. You can, however, execute DOE-2REV as a separate application for post-processing DOE-2.2 results.

Input Data Types

PowerDOE inputs can either be user-input values (directly input by you), DOE-2.2 defaults (program default values used in the absence of user inputs), user defaults (established by you), DOE-2.2 library data (data retrieved from the DOE-2.2 library), or formula-like “expressions.” PowerDOE labels each of these data types (small labels to the left of the input controls) and displays them in different font colors, permitting you to visually distinguish between them.

Online Help Feature

PowerDOE includes a comprehensive online help system. Context-sensitive help is available for every data entry field and for every program screen. When you point to a data field and click the right mouse button, PowerDOE displays a drop down “Quick Menu” beside that field. You can then select Field Help for the particular field, or Topic Help for information on the current screen. Help is also available from the main menu bar or by pressing F1, and includes standard Windows Help components such as Contents and a Search Keywords dialog box. In addition, the online help system contains extensive hypertext links that provide quick access to related topics.

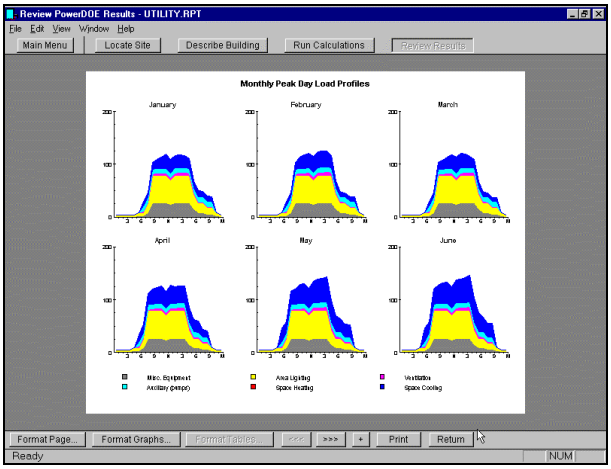


Figure 14: Example Review Results Utility report showing peak day electrical profiles

Modular Structure
PowerDOE has a modular structure that allows sections of the program to be externally accessed or to be connected with other analysis tools. This structure also enables third-party developers to use PowerDOE's interface modules and the DOE-2.2 simulation engine in their applications.

Machine Requirements
The *minimum* PowerDOE computer requirements are: Pentium PC, color VGA monitor, 32 Mb of RAM memory, 200 Mb of free hard drive space; a Super-VGA monitor is suggested for best display of graphics. Microsoft Windows 3.1 is the *minimum* operating environment; Windows95 is recommended and Windows NT is also supported. Although no conflicts are anticipated, PowerDOE under Windows 98 is still being evaluated.

Future Enhancements
Subsequent releases of PowerDOE will incorporate additional features; details of these features will be the subjects of future articles. Features funded and under development include:

- Wizards for guiding you step-by-step through the process of describing a building and creating building components plus a library of prototype building models — you will be able to customize a prototype by specifying building type (office, hospital, etc.), size (large, medium, small), vintage (pre 1970's, 1970's, 1980's, etc.), and location.
- Design "agents" to help you select better energy and cost performing design alternatives —initial agents are being developed for glazing and HVAC system selection.
- Building type-specific modeling applications designed to allow rapid analysis of specific building types — initial applications for food service, supermarkets, central plants, and refrigerated warehouses.

Availability
PowerDOE is expected to be available for commercial distribution in July or August of 1998. Email Jeff.Hirsch@DOE2.com or visit www.doe2.com to obtain the latest details, list of distributors, costs, licensing information, free evaluation copies, tutorial and training information.

What's New? (continued)

¨ **Please welcome these new DOE-2 Consultants:**

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GenOpt

A Generic Optimization Program*

Version 1.0 Ready for Alpha Testing

by
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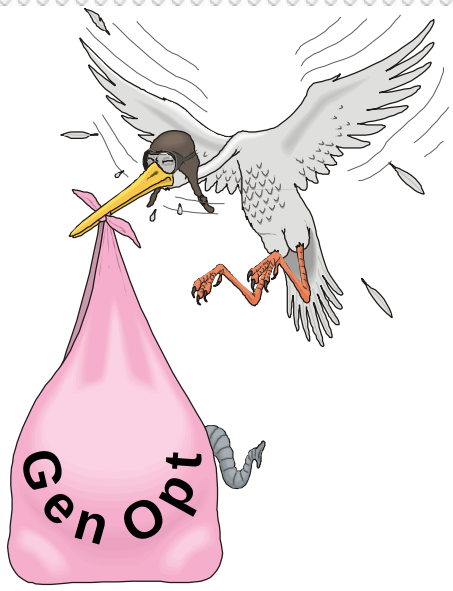
Visiting Scientist
Simulation Research Group
Lawrence Berkeley National Laboratory
Berkeley, CA 94720



What is GenOpt?

GenOpt is a generic optimization program being developed by Michael Wetter, a visiting researcher with LBNL's Simulation Research Group. GenOpt is being developed for system optimization, such as determining the value of parameters that lead to the best operation of a given system or identifying unknown parameters in a data-fitting process. It automatically optimizes a user-selected *objective function,* such a building's calculated annual energy use, peak electrical demand, or PPD value. However, GenOpt is not only an optimization program; it also offers an interface for easily implementing your own optimization algorithms into its library.

Why Use Optimization?

Usually, a lot of time is spent specifying the input for a simulation model, but once this is done, the user usually does not try to optimize it. This can be because there is no time left to do the (tedious) process of changing input values, running the simulation, interpreting the new results and guessing how to change the input for the next trial, or because the systems being analyzed are so complex that the user is just not capable of understanding the interactions of the various parameters. However, by using GenOpt, it is possible to do automatic multi-parameter optimization with search techniques that require only a little effort.

How GenOpt Works

To perform the optimization, GenOpt automatically writes an input file for the simulation program. The generated input file is based on an input template, written for the simulation program. GenOpt then launches the simulation program, reads the value of the function being minimized from the simulation result file, checks possible simulation errors and then determines a new set of input parameters for the next run. The whole process is repeated iteratively until the minimum of the function is found. If the simulation problem has some underlying constraints, they can be taken into account either by a default implementation or by modifying the function that has to be minimized. GenOpt offers a default scheme for simple constraints on the independent variables (box-constraints), as well as a formalism that allows adding constraints to the simulation problem by means of so-called *penalty* or *barrier functions*. For example, GenOpt could be used to find the area of the windows or different facades of a house that minimizes annual energy use subject to the constraint that each area must be within user-specified minimum and maximum values.

Interface for Simulation Program

* The development of GenOpt is sponsored by a grant from the Swiss Academy of Engineering Sciences (SATW) and the Swiss National Science Foundation (SNSF). GenOpt is also partially supported by the U.S. Department of Energy (DOE).

GenOpt has an open interface on both the simulation program side and the optimization algorithm side. It allows the easily coupling of any external program (like SPARK, DOE-2, BLAST or any user-written program) by modifying a configuration file.

The data exchange between GenOpt and the external program is done with text files only (Figure 1). For performing the optimization, GenOpt, based on an input template file, automatically generates a new input file for the simulation engine. To generate such a template, the user accesses the already-defined simulation input file and replaces the numerical values of the parameters to be modified with keywords. GenOpt then replaces those keywords with the corresponding numerical values and writes the simulation input file. This approach makes GenOpt capable of writing text input for any simulation program. In a configuration file, you can specify how the simulation program is to be launched and where GenOpt can find the current value of the objective function to be minimized. This makes it possible to couple any external program to GenOpt without modifying and recompiling either program. The only requirement of the external program is that it must read its input from a text file and write the function value to be minimized (plus any possible error messages) to a text file.

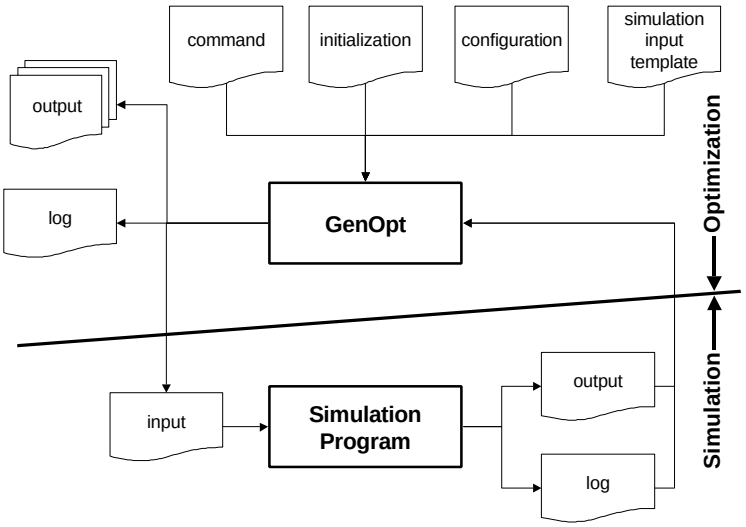


Figure 1: Interface of GenOpt and the simulation program

Interface for Optimization Algorithm

Users can easily implement their own optimization algorithms by extending the parent class "Optimizer" that offers access to the GenOpt kernel (Figure 2). This parent class is the interface between the GenOpt kernel and the optimization algorithm; it offers methods to retrieve the required settings for the specific algorithm, the initial values of the free parameters, possible bounds of those values and several other methods like evaluating a simulation with the current set of free parameters or reporting the results of the optimization run. Thus, the user has only to deal with the actual optimization algorithm itself and not with the data handling, output writing, syntax checking and other tedious work.

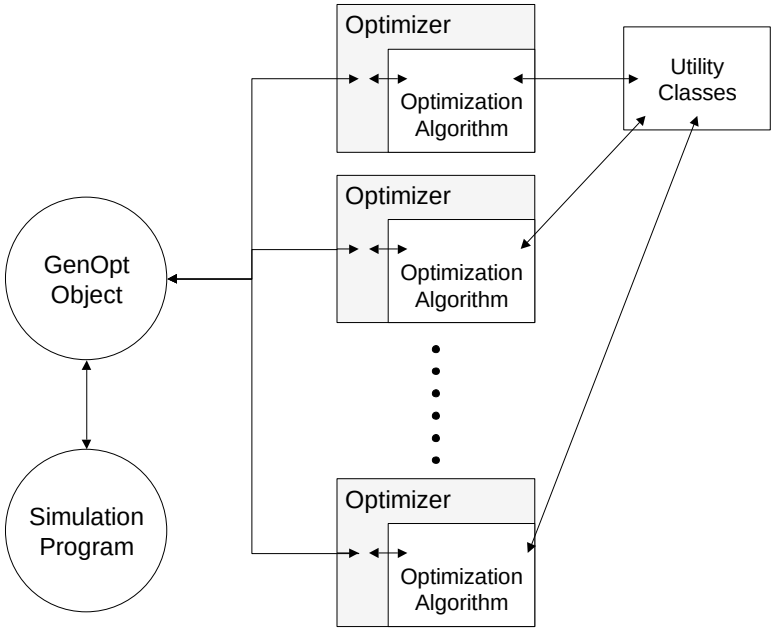
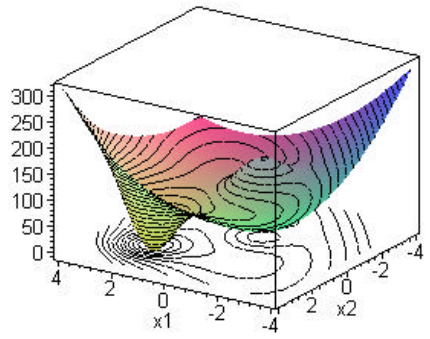


Figure 2: Implementation of optimization algorithms into GenOpt

Utility classes (e.g., for linear algebra, calculating the gradient, performing a line-search or checking the optimality conditions) can either be shared by different algorithms or among various users.

Status of GenOpt 1.0 Alpha

GenOpt is currently being developed as a console application, written entirely in Java so that it is completely platform independent. The interface for coupling any external simulation program and implementing additional algorithms is ready. GenOpt has been successfully tested on Unix Solaris 2.5.1, Windows NT and Windows 95.



$$b = [1 \quad 2] \qquad Q = \begin{pmatrix} 10 & 6 \\ 6 & 8 \end{pmatrix}$$

$$f_1 = b^T x + \frac{1}{2} x^T Q x$$

$$f_2 = 100 \arctan\left((2 - x_1)^2 + (2 - x_2)^2\right)$$

$$f_3 = 50 \arctan\left((-0.5 - x_1)^2 + (-0.5 - x_2)^2\right)$$

$$f = \sum_{i=1}^{3} f_i$$

Figure 3: Plot of a two-dimensional test function defined by the equations on the right.

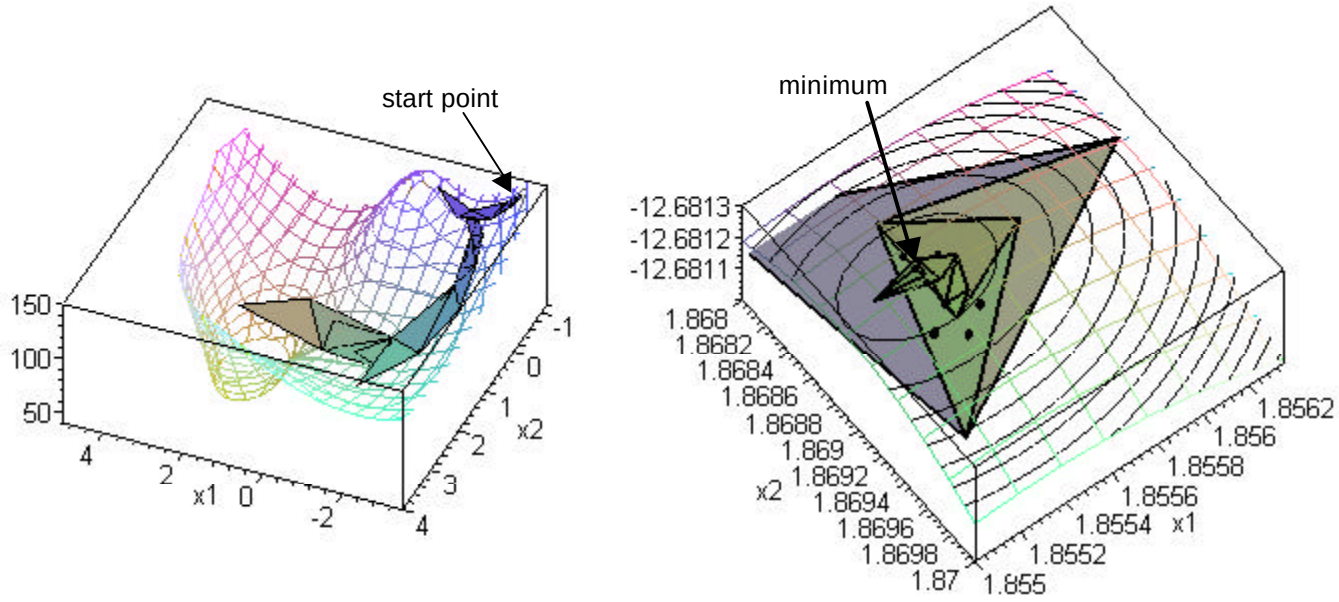


Figure 4 Representation of the search path taken by GenOpt to find the minimum of the function shown in Fig. 3. The triangles represent approximations to the objective function on the search path. The left-hand picture shows the start of the optimization. The right-hand picture (viewed upside-down for clarity) shows the minimum being achieved at x1 = 1.8553 and x2 = 1.8688. The dots in the right-hand picture indicate the test of the optimality condition.

The currently-implemented optimization algorithm (Simplex method of Nelder and Mead with the extension of O'Neill) has been successfully tested on several functions. The example given in Fig. 4 shows how the program finds the minimum of the function in Fig. 3.The Simplex method is efficient for problems with up to about 10 free variables.

The alpha version of GenOpt is ready to be tested by a limited number of users. For further information and to register as a tester, please visit the GenOpt web page at http://eetd.lbl.gov/btp/simulations/ .

DesiCalc™, developed by the Gas Research Institute, is state-of-the-art software for screening desiccant cooling applications.

Desiccant-based air-conditioning equipment is emerging as an attractive, low-cost option for supplementing conventional heating, ventilation, and air-conditioning systems. Application of desiccant-based equipment improves indoor air quality and allows more cost-effective compliance with ASHRAE 62-89 standard-based building codes.

The database includes templates for 11 typical commercial buildings: hospitals (surgical suites), small and large hotels, ice arenas, nursing homes, quick-service restaurants, retail stores, schools, supermarkets, movie theaters, and refrigerated warehouses. Initially, it has been set up with weather data and typical utility rates for 16 cities: Atlanta, Baltimore, Charleston, Chicago, Cleveland, Dallas, Houston, Jackson (MS), Miami, Minneapolis, Nashville, New Orleans, New York, Raleigh, St. Louis and Tampa. DesiCalc also permits the use of custom utility rates and provides weather data to evaluate 220 other U.S. cities.

DesiCalc allows estimation of annual or monthly energy loads (using hour-by-hour simulations) and costs for any of the 11 typical commercial buildings in any of the 236 geographical locations. The tool uses electrical equipment selected from a library of five typical systems and compares the performance of any of the systems with an alternative configuration, the chosen electric system supplemented with a desiccant dehumidifier.

DOE-2.1E is DesiCalc's computational engine that runs in the background. The program also uses the latest TMY2 meteorological database.

Cost for the program and documentation is $295. The CD-ROM contains DesiCalc with help files; it is accompanied by a printed copy of the User Manual, complete with sample reports, charts and the application type details. There is also a toll-free support number at 1-877-DESI-CALC (337-4225). Contact the GRI Fulfillment Center to order the program. Phone (773) 399-5414, Fax (630) 406-5995 or email Fillit@compuserve.com and request document No. GRI-98/0127.
IL residents add 8.75% sales tax,
VA residents add 4.5% sales tax.
Shipping and handling for 1 copy is $20, for 2-3 copies is $30, for 4 or more copies is $40.

For more information, contact
Doug Kosar, Gas Research Institute,
Tel: (773) 399-4626.

"Building Loads Analysis and System Thermodynamics"

blastnews

BLAST Support Office (BSO)

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http://www.bso.uiuc.edu

The **Building Loads Analysis and System Thermodynamics (BLAST)** system is a comprehensive set of programs for predicting energy consumption and energy system performance and cost in buildings. The BLAST system was developed by the U.S. Army Construction Engineering Research Laboratory (USACERL) under the sponsorship of the Department of the Air Force, Air Force Engineering and Services Center (AFESC), and the Department of the Army, Office of the Chief of Engineers (OCE). After the original release of BLAST in December 1977, the program was extended and improved under the sponsorship of the General Services Administration, Office of Professional Services; BLAST Version 2.0 was released in June 1979. Under the sponsorship of the Department of the Air Force, Aeronautical System Division, and the Department of Energy, Conservation and Solar Energy Office, the program was further extended; BLAST Version 3.0 was completed in September 1980. Since 1983, the BLAST system has been supported and maintained by the BLAST Support Office at the University of Illinois at Urbana-Champaign.

BLAST can be used to investigate the energy performance of new or retrofit building design options of almost any type and size. In addition to performing peak load (design day) calculations necessary for mechanical equipment design, BLAST also estimates the annual energy performance of the facility, which is essential for the design of solar and total energy equipment design, BLAST also estimates the annual energy performance of the facility, which is essential for the design of solar and total energy (cogeneration) systems and for determining compliance with design energy budgets. Repeated use of BLAST is inexpensive; it can be used to evaluate, modify, and re-evaluate alternate designs on the basis of annual energy consumption and cost.

The BLAST analysis program contains three major subprograms:

- The Space Load Prediction subprogram computes hourly space loads in a building based on weather data and user inputs detailing the building construction and operation.
- The Air Distribution System Simulation sub-program uses the computed space loads, weather data, and user inputs describing the building air- handling system to calculate hot water, steam, gas, chilled water, and electric demands of the building and air-handling system.
- The Central Plant Simulation subprogram uses weather data, results of the air distribution system simulation, and user inputs describing the central plant to simulate boilers, chillers, on-site power generating equipment and solar energy systems; it computes monthly and annual fuel and electrical power consumption.

Heat Balance Loads Calculator (HBLC)
The BLAST graphical interface (HBLC) is a Windows-based interactive program for producing BLAST input files. HBLC allows the user to visualize the building model as it is developed and modify previously created input files. Within HBLC, each story of the building is represented as a floor plan which may contain several separate zones. Numerous other building details may be investigated and accessed through simple mouse operations. On-line helps provide valuable on-the-spot assistance that will benefit both new and experienced users. HBLC is an excellent tool which will make the process of developing BLAST input files more intuitive and efficient. You can download a demo version of HBLC (for MS Windows) from the BLAST website (User manual included!).
A FREE UPGRADE IS AVAILABLE to registered users. To obtain a password and instructions for downloading, e-mail to: support@blast.bso.uiuc.edu, or call (217) 333-3977. This upgrade may also be obtained by post for a nominal fee.

WINLCCID 97
LCCID (Life Cycle Cost in Design) has been a standard in the DoD community since its initial release in 1986. LCCID was developed to perform Life Cycle Cost Analyses (LCCA) for the Department of Defense and their contractors, yet it goes far beyond being just a DoD study tool by providing many features of a general purpose life cycle costing tool. With LCCID, it's easy to carry out "what-if" analyses based on variables such as present and future costs and/or maintenance and repair costs. LCCID allows an analysis based on standard DoD procedures and annually updated escalation factors as well as Energy Conservation Investment Program (ECIP) LCCA. You can download a demo version of WINLCCID 97 (for MS Windows) from the BLAST website

http://www.bso.uiuc.edu

[See *User News* Vol. 16, No. 4, p. 5].

To order BLAST-related programs, contact Russ Taylor at support@blast.bso.uiuc.edu

BLAST Order Information

Program Name	Order Number	Price Each
PC BLAST Package The standard PC BLAST Package includes the following programs: BLAST, HBLC, BTEXT, WIFE, CHILLER, Report Writer, Report Writer File Generator, Comfort Report program, Weather File Reporting Program, Control Profile Macros for Lotus or Symphony, and the Design Week Program. A soft copy of the BLAST manual will be included as help files with the software. Executable version of BLAST Software Package for an IBM 386/486/Pentium.	3B386E3-0695	$950.00
PORTABLE BLAST (on DOS Formatted Disks) PC BLAST package plus FORTRAN source code	3BPORA3-0695	$1500.00
WINLCCID 97: executable version for 386/486/Pentium	3LCC3-0797	$295.00
WINLCCID 97: update from WINLCCID 96	4LCC3-0797	$195.00
BLAST 3.0 Documentation Set (Enter Quantity) Printed version in a 3-ring binder	1001-0695	$250.00
The last four digits of the catalog number indicate the month and year the item was released or published. This will enable you to see if you have the most recent version. All software will be shipped on 3.5" high density floppy disks unless noted otherwise.		

DOE-2 Directory of Program Related Software and Services[1]

Mainframe/Workstation Versions of DOE-2

Program Name	Operating System	Description	
DOE-2.1E From the Energy Science and Technology Software Center (ESTSC)	SUN-4 DEC-VAX	Source code, executable code and complete current documentation for: DOE-2.1E/Version 094 for SUN-4 DOE-2.1E DEC-VAX	For a complete listing of the software available from ESTSC, order their "Software Listing" catalog, ESTSC-2. [See *User News* Vol. 16, No. 3, p. 21]
FTI/DOE (see FTI listing under PC Versions of DOE-2, below)			

PC Versions of DOE-2

Program Name	Operating System	Description
ADM-DOE-2 Based on J.J. Hirsch DOE-2.1E (latest version)	DOS Windows 95	ADM-DOE-2 (DOE-2.1E) is compiled for use on 386/486 PCs with a math co-processor and 4MB of RAM. The package contains everything needed to run the program: program files, utilities, sample input files, and weather files. More than 300 weather files are available (TMY, TRY, WYEC, CTZ formats) for the U.S. and Canada. [See *User News* Vol. 7, No. 2, p. 6]
Compare-IT Based on J.J. Hirsch DOE-2.1E (latest version)	Windows (98, 95, NT)	Compare-IT allows DOE-2 professionals to add value to their projects by giving clients "what-if" scenarios using DOE-2. The interface is designed for novice energy analysts and the GUI can be customized for each client's particular interests. A tabbed main window is configured based on the user's DOE-2 macro organization. All labels, drop-down list boxes, tool-tips, error checking, and help files are created dynamically from a "Compare-IT-ized" DOE-2 input file. Output are tables and powerful graphs of annual costs, annual energy and end-use and hourly end-use values. [See *User News* Vol. 19, No. 1]
DOE-PLUS Based on J.J. Hirsch DOE-2.1E (latest version) Demo: www.halcyon.com/byrne	DOS Windows (3.1, 95, NT)	Complete support for all DOE-2 commands. Imports BDL files created with a text editor or other program. Interactive error checking. 3-D view of building can be rotated and zoomed. Windows, walls, etc., identified by DOE-2 U-name and allow component editing. User-defined libraries of schedules, HVAC systems, plant equipment, building components, etc. Exports results to spreadsheets and database programs. Graphical display of schedules. Utility programs included: Prep, Demand Analyzer, weather processor. Over 500 worldwide weather files. [See *User News* Vol. 13, No. 2, p. 54, Vol. 16, No. 1, p. 28-32]
EnergyPro Based on ESTSC[2] DOE-2.1E V. 092 Demo: www.energysoft.com	Windows (95, NT)	Performs nonresidential load calculations for HVAC equipment sizing. Produces typeset quality reports/forms. Electronically exports forms to AutoCad for inclusion on blueprints. On-line help. 344 weather files for the U.S. and Canada. For California Users: Performs Title 24 compliance calculations, includes state-certified HVAC and DHW Equipment directories, Title 24 tailored lighting calculations. [See *User News* Vol. 18, Nos. 2, 4]
EZDOE Based on J.J. Hirsch DOE-2.1D Demo: www.elitesoft.com	DOS	Provides full screen, fill-in-the-blank data entry, dynamic error checking, context-sensitive help, mouse support, graphic reports, a 750-page user manual, and extensive weather data. EZDOE integrates the full calculation modules of DOE-2 into a powerful, full implementation of DOE-2 on DOS-based 386 and higher computers. On-line help. Includes some weather files. *[See User News Vol. 14, No. 2, p. 10 and No. 4, p. 8-14]*
FTI/DOE Based on ESTSC[2] DOE-2.1E V. 092 No demo, 30-day trial period	DOS Windows (3.x, 95, NT) AIX, ULTRIX, VMS, Linux, NeXTStep,	FTI/DOE is 100% compatible with LBNL version. Highly optimized and extremely reliable. Version 3.1 will include a graphical user interface and will provide full command functionality and access to all reporting features of the original. Interface is Java-based and will be available for any system supporting Java. Source code versions will compile with most F77-compliant compilers. On-line help: Yes for Version 3.x, No for Version 2.x. 344 weather files for the U.S. and Canada. *[See User News Vol. 12, No. 4, p. 16]*

[1] This information is based on a December 1997 survey of DOE-2 product vendors.

[2] Energy Science & Technology Software Center at Oak Ridge National Laboratory

DOE-2 Directory of Program Related Software and Services

Mainframe/Workstations Versions of DOE-2

Interface / Output	Support	Program Price	Vendor Information
	Limited "operational" support, which includes telephone assistance concerning installation, media, or platform questions.	SUN version: Govt/Educ $400 U.S., Mexico, Canada $1305 Other Foreign $2000 VAX version: Govt/Educ $500 U.S., Mexico, Canada $1835 Other Foreign $2716	**Energy Science and Technology Software Center** P.O. Box 1020 Oak Ridge, TN 37831-1020 Ph: 423-576-2606 / Fx: 423-576-2865 ESTSC@ADONIS.OSTI.GOV www.doe.gov/html/osti
FTI/DOE (see FTI listing under PC Versions of DOE-2, below)			

PC Versions of DOE-2

Interface / Output	Support	Program Price	Vendor Information
No information given No information given	None	$395 + $15/SH including one set weather data (your choice) and documentation	**ADM-DOE- 2 (Richard Burkhart)** ADM Associates adm_asc@ns.net 3239 Ramos Circle Sacramento, CA 95827-2501 Ph: 916-363-8383 / Fx: 916-363-1788
Customizable windows GUI dynamically built based on DOE-2 macros. Tables and graphs exportable to MS Excel 97. Custom reports dynamically generated in Word 97.	Support price is negotiable; online help included with the program.	$500 consultant $2000 client Documentation available	**Compare-IT (John Kennedy)** RLW Analytics 1055 Broadway, Suite G Sonoma, CA 95476 Ph: 707-939-8823 / Fx: 707-939-9218 Info@rlw.com or www.rlw.com
Interactive, graphical, fill-in-the-blanks Customizable tables and graphics	Unlimited, except for DOE-2 modeling advice. On-line help.	$895 with DOE-2 and doc $495 without DOE-2 Source code not available.	**DOE-Plus (Steve Byrne)** Item Systems 321 High School Road NE #344 Bainbridge Island, WA 98110 Ph: 206-855-9540 / Fx: 206-855-9541 byrne @ item.com
Graphical Graphs, forms	Unlimited support	$1095 w/documentation Source code not available.	**EnergyPro (Demian Vonderkulen)** Gabel Dodd/EnergySoft 100 Galli Drive #1 Novato, CA 94949-5657 Ph: 415-883-5900 / Fx: 415-883-5970 demian@energysoft.com
Fill-in-the-blanks Standard DOE reports plus some custom graphic reports	Unlimited phone support	$1295 w/documentation Source code not available.	**EZDOE (Bill Smith)** Elite Software P.O. Box 1194 Bryan, TX 77806 Ph: 409-846-2340 / Fx: 409-846-4367 bsmith @ elitesoft.com
Version 2.x: text based Version 3.x: graphical All standard DOE-2 reports Run time and status graphics	Free support for 90 days from date of purchase. After 90 days, support is: $35 email per incident $55 hour per incident $125 per hour for engineering advice. Bugs reports free.	$ 995.99 US w/documentation $1066 Int'l w/documentation $4999.99 source code	**FTI/DOE2 (Scott A. Henderson)** Finite Technologies Inc. 3763 Image Drive Anchorage, Alaska 99504 Ph: 907-333-8937 / Fx: 907-333-4482 info @ finite-tech.com

Caveat : We list third-party DOE-2-related products and services for the convenience of program users, with the understanding that the Simulation Research Group does not have the resources to check the DOE-2 program adaptations and utilities for accuracy or reliability.

DOE-2 Directory of Program Related Software and Services[1] (continued)

PC Versions of DOE-2

Program Name	Operating System	Description
MICRO-DOE2 Based on ESTSC[2] DOE-2.1E V. 088 Demo: call vendor	DOS Windows (3.1, 95, NT)	Widely-used, reliable, and tested. Includes automatic weather processing, batch file creation, and a *Users Guide* with instructions on how to set up a RAM drive. System requirements: 386/486 PC with 4 Mb of RAM and math co-processor. Optional BDL-Builder simplifies input (see "Pre- and Post-Processors for DOE-2). On-line help. Program includes some weather files. [See *User News* Vol. 7, No. 4, p. 2; Vol. 11, No. 1, p. 2; Vol. 15, No. 1, p. 8; Vol. 15, No. 3, p. 4; Vol. 16, No. 2, p. 1,7; Vol. 16, No. 4, p. 7-8]
PRC-DOE-2 Based on J.J. Hirsch DOE-2.1E (latest version) No demo	DOS Windows (95, NT)	The complete and latest version of DOE-2.1E. This text-based version of DOE-2 is fast, reliable, and very up to date. Documentation includes 2.1E Supplement, 2.1E BDL Summary; original Reference Manual available. Extensive information on new features is included on the disk as well, including information on new system types, new commands, new options, etc., added to later versions of 2.1E.
VisualDOE2.6 Based on J.J. Hirsch DOE-2.1E, V. 083 Demo: www.eley.com	DOS Windows (3.1, 95, NT)	Dramatically faster construction of building geometry using pre-defined blocks and/or drawing interface. Import zone shapes from CADD file (dxf format). Point-and-click to define zone properties and HVAC systems. Define up to 20 design alternatives in each project file. View rotatable 3-D image of model. Create custom hourly output reports and customized graphs. Edit and expand library of constructions, schedules, equipment, and utility rates. Add custom performance curves. Network version allows sharing of libraries. On-line help. 400+ weather files for the U.S., 12+ weather files for Canada, plus selected locations around the world. *[See User News Vol. 15, No. 2, p. 10; Vol. 16, No. 4, p. 9-16; Vol. 17, No. 4, p. 8-13]*

Pre- and Post-Processors for DOE-2

Program Name	Description
BDL Builder and **E2BB**	**BDL Builder** is a user-friendly Windows-implemented pre-processor for DOE-2.1E that allows the description of specific building and HVAC characteristics with numeric input by preparing databases, or building blocks, and then selecting records from the databases to assemble a complete input. **E2BB** translates existing DOE-2.1E text input to **BDL Builder**.
DrawBDL	**DrawBDL,** Version 2.02, is a graphic debugging and drawing tool for DOE-2 building geometry. DrawBDL reads your BDL input and makes a rotatable 3-D drawing of your building with walls, windows, and building shades shown in different colors for easy identification. *[See User News, Vol. 14, No. 1, p. 5-7, Vol. 14, No. 4, p. 16-17, and Vol. 16, No. 1, p.37]*
Visualize-IT (Visual Data Analysis Tools)	The ***Energy Information Tool*** is a program for looking at and understanding metered or DOE-2.1E hourly output data. It provides the unprecedented ability to see all 8760 (or 35040) data points for a year's worth of data. You get an overview of the data with an EnergyPrint and can then explore the data with a variety of tools including load shapes, load duration curves, etc. This program requires a 486 or higher computer and SVGA graphics capabilities. The ***Calibration Tool*** is a program for comparing DOE-2.1E hourly output data to total load and/or end-use metered data. Options include monthly demand and load 2D graphs, maximum and seasonal load shapes, average load profiles, end use residuals, monthly average week and weekend days, and dynamic comparison load shapes. This program requires a 486 or higher computer and SVGA graphics capabilities. *[See User News Vol. 17, No. 2, p. 2-6]*
PRC-TOOLS: **PRC-Grab** **PRC-Hour** **PRC-Peak**	***PRC-Tools*** is a set of programs that aids in extracting, analyzing, and formatting DOE-2 output. ***PRC-Grab*** automates the process of extracting any number of answers from DOE-2 standard output files. ***PRC-Hour*** and ***PRC-Peak*** format the hourly output and create Peak-Day and Average-Day load shapes for any number of periods and for any combination of hourly values.

[1] This information is based on a December 1997 survey of DOE-2 product vendors.

DOE-2 Directory of Program Related Software and Services (continued)

PC Versions of DOE-2

Interface / Output	Support	Program Price	Vendor Information
Fill-in-the-blanks	Assistance provided to install and initially use program. Reasonable support thereafter. Training available at Users office. Support price negotiated individually.	$500 w/documentation Source code available, call for price.	**MICRO-DOE2 (Don Croy)** Acrosoft/CAER Engineers 1204-1/2 Washington Avenue Golden, CO 80401 Ph: 303-279-8136 / Fx: 303-279-0506 102447.2611@compuserve.com
Standard text-based	Unlimited support.	$ 495 w/documentation Source code not available.	**PRC-DOE-2 (Paul Reeves)** Partnership for Resource Conservation 140 South 34th Street Boulder, CO 80303 Ph: 303-499-8611 / Fx: 303-554-1370 Paul.Reeves@DOE2.com
Graphical	90 days free phone and email support. Support is $195 per year after first 90 days	$495 w/documentation Source code not available.	**VisualDOE2.6 (C. Eley or Erik Kolderup)** Charles Eley Associates 142 Minna Street San Francisco, CA 94105 Ph: 415-957-1977 / Fx: 415-957-1381 support@eley.com

Pre- and Post-Processors for DOE-2

Operating System	Works with this version of DOE-2	Price	Vendor
Dos or Windows 3.1, 95	All 2.1E "stock" versions of the program	BDL Builder $750.00 E2BB $45.00	**MICRO-DOE2 (Don Croy)** Acrosoft/CAER Engineers 1204-1/2 Washingtin Avenue Golden, CO 80401 Ph: 303-279-8136 / Fx: 303-279-0506 102447.2611@compuserve.com
Windows 3.1, 95, NT	DOE-2.1E	$125.00 plus shipping	**Joe Huang & Associates** 6720 Potrero Avenue El Cerrito, CA 91364 Ph/Fx: 510-236-9238
Windows 3.1	DOE-2.1E		**RLW Analytics, Inc. (Pat Bailey** 1055 Broadway, G **John Kennedy)** Sonoma, CA 95476 Ph: 707-939-8823 Fx: 707-939-9218 Info@rlw.com www.rlw.com
Windows 95, NT	All versions of DOE-2	$99.00	**PRC-DOE-2 (Paul Reeves)** Partnership for Resource Conservation 140 South 34th Street Boulder, CO 80303 Ph: 303-499-8611 / Fx: 303-554-1370 Paul.Reeves@DOE2.com

TOOLS AND TRAINING

Building Energy Simulation User News **(a quarterly newsletter)** Sent without charge, the newsletter prints documentation updates and changes, bug fixes, inside tips on using the programs more effectively, and articles of special interest to users of DOE-2, BLAST, SPARK and their derivatives. The winter issue features an index of articles printed in all the back issues. Also available electronically at http://eande.lbl.gov/BTP/SRG/UNEWS	Simulation Research Group Bldg. 90, Room 3147 Lawrence Berkeley National Laboratory Berkeley, CA 94720 Contact: Kathy Ellington Fax: (510) 486-4089 kathy@srge.lbl.gov
Help Desk Bruce Birdsall Call or fax Bruce Birdsall if you have a DOE-2 problem or question. If you need to fax an example of your problem to Bruce, please be sure to telephone him prior to sending the fax. This is a free service provided by the Simulation Research Group at Lawrence Berkeley National Laboratory.	Bruce Birdsall Phone/Fax: (925) 671-6942 (phone before you fax, please) Monday through Friday 10 a.m. to 3 p.m. Pacific Time
Training DOE-2 courses for beginning and advanced users.	Marlin Addison Phone: (602) 968-2040 Maddiso@ix.netcom.com
Instructional DOE-2 Video and Manual Takes you step-by-step in DOE-2.1D input preparation and output interpretation.	Dr. Michael Brandemuehl, Director JCEM/U. Colorado CEAE Dept CB 428 Boulder, CO 80309-0428 Phone: (303) 492-3915, fax 492-7317

DOE-2.1E Bug Fixes via FTP

If you have Internet access you can obtain the latest bug fixes to the LBNL version of DOE-2.1E by anonymous ftp. Here's how…

ftp to either gundog@lbl.gov or to 128.3.254.10
login: *type* anonymous
passwd: *type in your e-mail address*

After logging on, go to directory pub/21e-mods ; bug fixes are in files that end with **.mod** . A description of the fixes is in file **VERSIONS.txt** in directory **pub** . Each fix has its own version number, ***nnn*** , which is printed out as DOE-2.1E- *nnn* on the DOE-2.1E banner page and output reports when the program is recompiled with the fix. You may direct questions about accessing or incorporating the bug fixes to Ender Erdem (ender@gundog.lbl.gov).

Correction to DOE-2.1E Supplement

"Index to the Window Library" Table 2.12, p. 2.107

In the DOE-2.1E "Index to the Window Library," the entries for G-T-C 2660 to 2668 should be changed as follows. Corrected numbers are shown in ***bold italic*** type. Note that G-T-C 2663, which was originally listed, has been removed from the index since there is no G-T-C 2663 entry in the library. There is no change to the library itself.

Double Low-E (e2=.04) Clear IG														
2660	2.38	.42	.51	.44	.39	.36	.70	.12	500	3.0	Air	6.3	***3***	***6.0***
2661	1.68	.30	.51	.44	.39	.36	.70	.12	500	3.0	Air	12.7	***3***	***6.0***
2662	1.34	.24	.50	.43	.39	.36	.70	.12	500	3.0	Arg	12.7	***3***	***6.0***
Double Low-E (e3=***.03***) Clear IG														
2663	Entry removed 6/12/98													
2664	1.67	.29	.48	.42	.34	.31	.68	.12	501	6.0	Air	12.7	3	6.0
2665	1.32	.23	.48	.42	.34	.31	.68	.12	501	6.0	Arg	12.7	3	6.0
Double Low-E (e2=***.03***) Tint IG														
2666	2.41	.42	.35	.31	.21	.14	.41	.08	550	6.0	Air	6.3	3	6.0
2667	1.67	.29	.33	.29	.21	.14	.41	.08	550	6.0	Air	12.7	3	6.0
2668	1.32	.23	.32	.28	.21	.14	.41	.08	550	6.0	Arg	12.7	3	6.0

The Answer Man

by Fred Winkelmann

Question	I am looking for a more extensive list of Monthly Average Atmospheric Moisture and Turbidity Values for cities in the US. I know there is a list of cities in the DOE-2.1E Supplement, but I'm looking for a larger database of these values. Can you help?
Answer	I am not aware of any data for these beyond those in the 2.1E Supplement. However, you could check with National Atmospheric and Oceanic Administration (NOAA) to see if they have some additional data.. See article on NOAA's and NCDC's (National Climatic Data Center) websites, p. 26.
Question	Is there a method of reading in total horizontal illuminance from an external file and eliminating the need for the turbidity and moisture values?
Answer	The soon-to-be-released DOE-2.2 bypasses the need for atmospheric turbidity values -- it uses the same Perez algorithm as used in the TMY2s to calculate exterior illuminance for measured solar radiation, sun position and other quantities available on the weather file. It also calculates atmospheric moisture hourly from dewpoint temperature, so the monthly average atmospheric moisture values are no longer needed. This approach is also being incorporated in DOE-2.1E and should be available later this year.
Question	Are you aware of any TMY2 to TMY converters so the TMY2 data can be used by DOE-2?
Answer	We can help you. For a TMY2 converter, contact Fred Buhl (WFBuhl@lbl.gov). He wrote one recently for DOE-2.2.

WEATHER RESOURCES

BinMaker: The Weather Summary Tool BinMaker is a CD-ROM based program that runs under Windows 95 or 3.1. It allows you to create summaries of U.S. hourly weather data (TMY2) then exports the results into spreadsheets or other analysis programs. Cost is $59.95 + $9.00 shipping (with a discount to GRI members).	Order No. GRI/98-0026 Gas Research Institute GRI Fulfillment Center 1510 Hubbard Drive Batavia, IL 60510 Phone: (773) 399-5414 / Fax (630) 406-5995 Email: Fillit@compuserve.com
DOE-2-Processed Versions of all TMY2 files for PC implementation (except CEARE)	ftp://anonymous:weather@gundog.lbl.gov/pub/JJHTMY2.zip
Comprehensive collection of **TRY**, **TMY** and **CTZ** weather file libraries, from NCDC, which can be used on all PC versions of DOE-2. Includes original source data and pre-formatted packed versions on a single IBM format CD. Individual sites available.	Jenny Lathum or Martyn Dodd Gabel Dodd / EnergySoft, LLC 100 Galli Drive, Suite 1 Novato, CA 94949 Phone: (800) 467-4738 Fax: (415) 883-5970
European Weather Files	Andre Dewint Alpha Pi, s.a. rue de Livourne 103/12 B-1050 BRUXELLES, Belgium Phone: 32-2-649-8359 / Fax: 32-2-649-9437
TMY data sets - download from the World Wide Web **TMY2** data sets and **TMY2 User Manual** - download from the World Wide Web [See *User News* Vol. 18, no. 2, p. 17]	TMY: http//oipea-www.rutgers.edu/html_docs/TMY/tmy.html TMY2: http://rredc.nrel.gov/solar/
TMY (Typical Meteorological Year) **TRY** (Test Reference Year)	National Climatic Data Center 151 Patton Avenue, #120 Asheville, NC 28801 Phone: (704) 271-4871 order Fax 271-4876
CTZ (California Thermal Climate Zones)	California Energy Commission Bruce Maeda, MS-25 1516-9th Street Sacramento, CA 95814-5512 1-800-772-3300 Energy Hotline
WYEC (Weather Year for Energy Calculation)	ASHRAE 1791 Tullie Circle N.E. Atlanta, GA 30329 Phone: (404)636-8400 / Fax: (404)321-5478
Canadian Weather Files in WYEC2 Format [Note: the original long-term data sets, up to 40 years of data, from which the CWEC files were derived can also be obtained directly from Environment Canada. Contact Mr. Robert Morris at (416) 739-4361.]	Dr. Didier Thevenard Watsun Simulation Lab University of Waterloo Waterloo, Ont., N2L-3G1 Canada Phone: (519) 888-4904 Fax: (519) 888-6197 watsun@helix.watstar.uwaterloo.ca

SPARK Beta Testing Phase I

update by
Edward F. Sowell
California State University at Fullerton

SPARK is a modular simulation environment that generates simulation programs from user-defined calculation components. It allows the easy creation of new components and the connection of existing components in innovative ways. SPARK components are algebraic (static) or differential (time-dependent) equations, which may be linear or non-linear.

SPARK may be thought of as a general differential/algebraic solver. This means that it can be used to solve any kind of mathematical problem described in terms of a set of differential and algebraic equations. The term *continuous systems* is often used to describe this class of problems. Typical examples include building heating and cooling systems, controls and heat transfer analysis. Models are expressed as systems of interconnected objects, either created by the user or selected from the library. An HVAC tool kit library comes with SPARK. Since SPARK objects are equation-based rather than algorithmic, they are input/output free. That is, there is no assumed directionality, so that a single model can be used to solve problems with various specified inputs. SPARK is unique in its ability to apply graph theory to automatically determine efficient solution strategies, often resulting in significant speed advantages as well as modeling convenience.

In recent months SPARK has undergone extensive modifications and is now in the beta testing phase. The new version is a complete re-write of the original SPARK, and includes new syntax for problem expression and significant improvements in internal structures and algorithms to enhance speed and flexibility. Both PC and Unix platforms are supported; each has graphical, point-and-click interface and command line usage. Note that although SPARK atomic object classes are expressed in C++, prior knowledge of C++ is not required. This is because SPARK atomic classes are single equations, and provided examples should be easy to follow. Also, symbolic tools are provided for automatic generation of these classes.

The beta version currently runs under Windows 95/NT, and the Unix version is expected to be released this fall. Since SPARK object classes are implemented in C++, a compiler is required. Microsoft, Symantec, Borland or GNU C++ compilers are currently supported for Windows 95/NT, and Sun and GNU compilers will be supported for Unix environments.

The current beta testing team includes 38 participants from 13 countries. After they familiarize themselves with exercises from the *User Manual*, testers are encouraged to try their own problems. Typically, these will be problems previously modeled with other simulation codes such as TRNSYS or HVACSIM+. For example, Philip Haves of the University of Loughborough converted an HVAC controls model from HVACSIM+ to SPARK. His results, to be presented at the Systems Simulation in Buildings Conference in Liege in December, show significant speedup. In other examples, Masaya Okumiya of Nagoya University has modeled test chamber temperature controls, Eugene van Heerden of Concordia University is modeling a ground source heat pump system, and Marjorie Musy of the University of La Rochelle is simulating zonal models of natural convection.

Testing is expected to continue through the summer. If you would like to participate, contact Kathy Ellington at *kathy@srge.lbl.gov*, or visit the web site *www.ecs.fullerton.edu/~sowell*

With support from the U.S. Department of Energy, SPARK is being developed by the LBNL Simulation Research Group, California State University at Fullerton, and Chapman University (Orange, CA).

* * * Featured Sites This Issue * * *

World-Wide Web Sites for Building Energy Efficiency

United States Department of Energy Building Standards & Guidelines Program http://www.energycodes.org

Residential Codes & Products

DOE provides support for the Model Energy Code (MEC) by developing compliance materials (called MECcheck) that simplify its use and by promoting training. The MECcheck Software (IBM-compatible) does all the necessary code compliance calculations. The MECcheck Prescriptive Packages show insulation and window requirements at a glance. The MECcheck Manual includes forms, checklists and worksheets for documenting compliance.
MECcheck materials can be downloaded at no cost.

Commercial Codes & Products

DOE supports commercial energy codes, especially ASHRAE 90.1, by helping with their development, and by providing tools and resources that make the codes easier to use. The COMcheck-EZTM materials were developed to simplify and clarify commercial and high-rise residential building energy code requirements. The materials include IBM-compatible software; compliance guides for envelope, lighting, mechanical requirements and prescriptive packages for county-based climate zones. Forms and checklist are included to document compliance. **All COMcheck-EZ materials can be downloaded at no cost.** If you download any materials, please register with the program so you will be notified of upgrades.

Comments? Questions?
E-mail al_parker@pnl.gov
Or call 800-270-CODE (2633).

U.S. Dept. of Energy Information Bridge https://apollo.osti.gov/dds/ (note "s" after http)

The Department of Energy (DOE) Information Bridge, developed and maintained by the DOE Office of Scientific and Technical Information (OSTI), makes DOE scientific and technical information electronically available to DOE employees and DOE contractors without charge. The DOE-generated information included in Information Bridge is contributed by the Scientific and Technical Information Program (STIP) partners at the various DOE and contractor research and development sites throughout the DOE complex.

The DOE Information Bridge is now available without password or registration requirements to the public through "GPO Access" at http://www.doe.gov/bridge.

Released on September 5, 1997, the DOE Information Bridge currently has over 23,000 full-text documents starting from January 1996. OSTI performs routine updates with a daily average of 35 full-text documents.

With the DOE Information Bridge, users are able to electronically access, locate, search, and download information. Users can select easy or advanced search options, choose which of three formats, GIF, TIFF and PDF, they wish to use to view data and which of two formats, PDF and multi-page TIFF, to download data. They can also choose options on a variety of features such as how they want data displayed and what type(s) of data they want to search.

DOE employees and DOE contractors wishing to obtain access should call OSTI at 423-576-8401 or 423-576-0487, or E-mail informationbridge@adonis.osti.gov.

National Oceanic and Atmospheric Administration (NOAA) http://www.noaa.gov
National Climatic Data Center (NCDC) http://www.ncdc.noaa.gov

Within the U.S. Department of Commerce is the National Oceanic and Atmospheric Administration (NOAA). NOAA conducts research and gathers data about the oceans, atmosphere, space and the sun.

The National Climatic Data Center is one of three National Data Centers under the National Environmental Satellite, Data, and Information Service (NESDIS), one of the NOAA Line Offices. NCDC is the world's largest active archive of weather data. NCDC produces numerous climate publications and responds to data requests from all over the world. NCDC operates the World Data Center for Meteorology and also supports a three tier national climate services support program.

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DOE-2 RESOURCE CENTERS

The people listed here have agreed to be primary contacts for DOE-2 program users in their respective countries. Each resource center has the latest program documentation, all back issues of the User News, and recent LBNL reports pertaining to DOE-2. These resource centers will receive copies of all new reports and documentation. Program users can then make arrangements to get photocopies of the new material for a nominal cost. We hope to establish resource centers in other countries; please contact us if you are interested in establishing a center in your area.

Australia

Murray Mason, ACADS BSG, 16 High Street, Glen Iris VIC. 3146, Australia
Tel: (61) 885 6586 / Fax: (61) 885 5974

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cmhui@hku.hk / http://arch.hku.hk/research/BEER/DOE-2/DOE-2.htm
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Joerg Tscherry, Building Equipment Section 175, EMPA, 129 Überlandstrasse, CH-8600 Dübendorf, Switzerland

Meetings, Conferences, Symposia

Green Building Challenge '98

To be held
October 26-28 , 1998
Vancouver, British Columbia

For further information:
Darinka Tolot, GBC 98
Conference Secretariat
CANMET Energy Tech Ctr
580 Booth St., 13th Floor
Ottawa, ON K1A 0E4
CANADA

Tel: 613.943.2259
Fax: 613.996.9099
dtolot@nrcan.gc.ca

Thermal Performance of the Exterior Envelopes of Buildings (Thermal VII)

To be held
December 7-11, 1998
Clearwater Beach, FL

For further information:
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Oak Ridge Nat'l Lab
Thermal Envelope Conf.
P.O. Box 2008 (Bldg 3147)
Oak Ridge, TN 37831-6070

Tel: 423.576.7942
Fax: 423.574.9331
unb@ornl.gov
www.ornl.gov/ORNL/
Energy_Eff/tectrans.html

IBPSA's Building Simulation '99

To be held
September 13-15, 1999
Kyoto, Japan

Call for Papers

Refer to the IBPSA web page for all deadlines:
www.mae.okstate.edu/ibpsa

One-page abstracts are due before September 30, 1998.

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User News Deadlines for 1998 and 1999

Shaded days on the calendar indicate deadline dates for either submission of articles or changes to vendor information. We always welcome articles about innovative uses for DOE-2, BLAST and their derivative programs.

1998

Jul							Aug							Sep						
M	Tu	W	Th	F			M	Tu	W	Th	F			M	Tu	W	Th	F		
		1	2	3							1				1	2	3	4		
6	7	8	9	10			3	4	5	6	7			7	8	9	10	11		
13	14	15	16	17			10	11	12	13	14			14	15	16	17	18		
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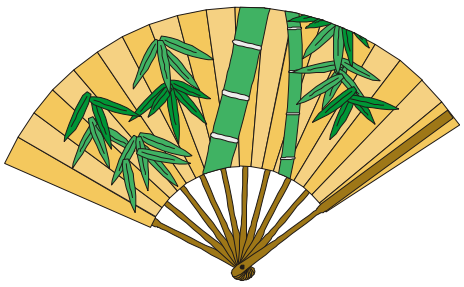

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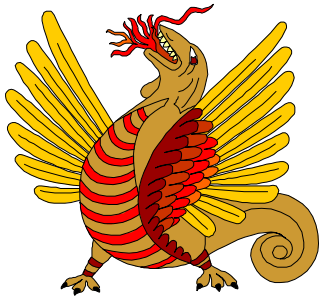

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